CLAIMS

1. A method of producing a molecular device including:

a step of crosslinking the bonding residues by using a molecular structure having a higher atomic density in the periphery than in the interior and having bonding residues in the periphery.

2. The method of producing a molecular device according to claim 1, characterized in that the molecular structure is constituted by a skeleton portion having a skeleton structure, and a terminal portion which is arranged in the outer shell of the skeleton portion, and the terminal portion has a higher atomic density than that of the skeleton portion and the terminal portion has bonding residues;

and that in the step of crosslinking the bonding residues, the bonding residues in the terminal portion of the molecular structure are crosslinked to form the molecular structure into a shell structure.

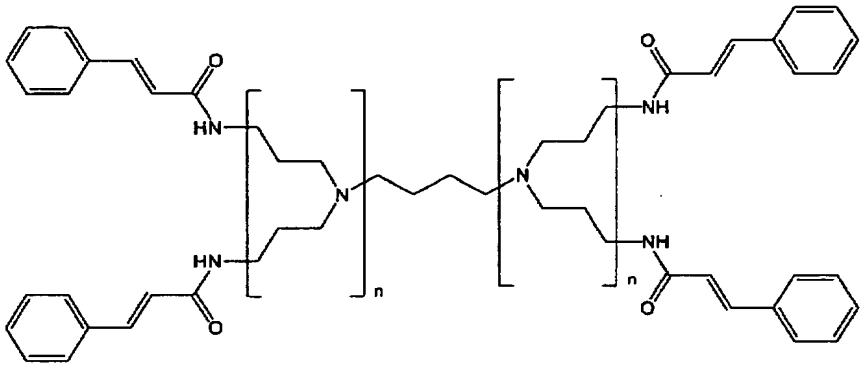
3. The method of producing a molecular device according to claim 1 or 2, wherein the bonding residue is an optically bonding residue.

4. The method of producing a molecular device according to any one of claim 1, 2 or 3, wherein the bonding residue has at least one of double bonds and/or triple bonds.

5. The method of producing a molecular device according to claim 1 or 2, wherein the bonding residue is any one of a cinnamic acid group, an α-cyano cinnamic acid group, a coumalin group, a chalcone group, a cinnamylidene acetate group, a p-phenylene diacrylate group, an acetylene group, a diacetylene group, a diphenyl acetylene group and an anthracene group.

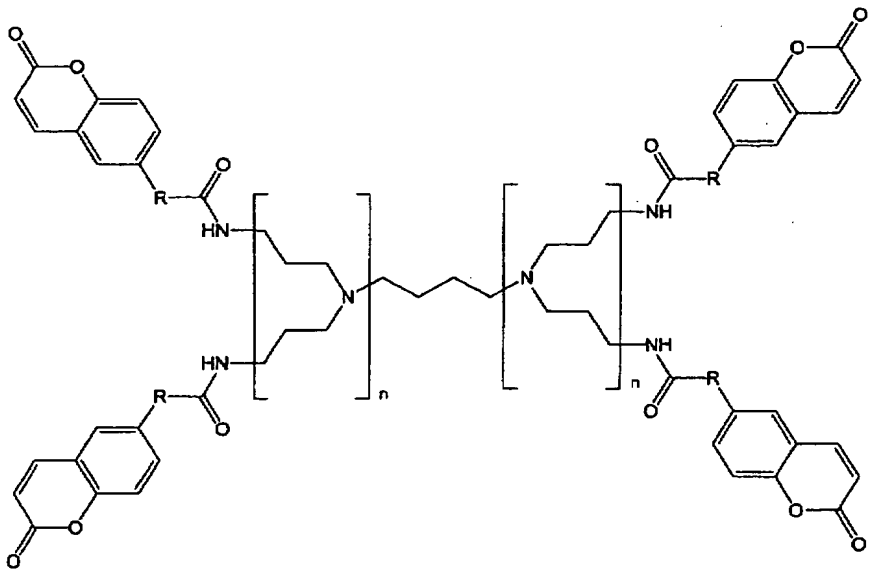
6. The method of producing a molecular device according to any one of claims 1 to 5, wherein the molecular structure is a dendrimer.

7. The method of producing a molecular device according to claim 6, wherein the dendrimer is expressed by the following formula (I) or (II):



(I)

wherein n represents an integer of 10 or less, and



(II)

wherein n represents an integer of 10 or less and R represents a linkage group.

8. The method of producing a molecular device according to claim 7, wherein R in the general formula (II) is an alkenyl group with C_1 to C_{10} or an alkynyl group with C_2 to C_{10}.

9. The method of producing a molecular device according to claim 7 or 8, wherein each n in the general formulas (I) and (II) is an integer of 2 to 10.

10. A molecular structure having a shell structure, wherein the shell is made by crosslinking the bonding residues of the molecular structure which has a higher atomic density in the periphery than in the interior and has the bonding residues in the periphery.

11. A molecular aggregate comprising association of a plurality of molecular structures, which is obtained by crosslinking bonding residues in the molecular structure that has a higher atomic density in the periphery than in the interior and has the bonding residues in the periphery.

12. A molecular device including the molecular structure having the shell structure according to claim 10, or the molecular aggregate according to claim 11.

13. A method of producing a molecular device including:
the step of obtaining a molecular structure having a shell structure by joining the bonding residues of the molecular structure,

wherein using a molecular structure having a plurality of bonding residues in the molecule, and a sensitizer, and imparting energy to the sensitizer.

14. A method of producing a molecular device including:

a step of using a molecular structure having a plurality of bonding residues in the molecule, and a sensitizer to impart energy to the sensitizer, and comprising;

one or both of an energy transfer process of transferring the energy to the bonding residues from the energy-imparted sensitizer, and an electron-imparting process of transferring electron(s) to the bonding residues from the energy-imparted sensitizer; and

a step of obtaining the molecular structure having a shell structure by using the energy transfer process or the electron-imparting process as a driving force for the chemical bonding reaction of the bonding residues.

15. A method of producing a molecular device including: the use of a molecular structure having a plurality of bonding residues in the molecule, a sensitizer and a crosslinking agent containing a plurality of bonding residues; and the step of crosslinking the bonding residues in the molecule of the molecular structure with the crosslinking agent by using an energy imparting step of imparting energy to the sensitizer, to obtain a molecular aggregate where a plurality of molecular structures are associated three-dimensionally.

16. A method of producing a molecular device including: the step of using a molecular structure having a plurality of bonding residues in the molecule, a sensitizer, and a crosslinking agent containing a plurality of bonding residues;

an energy imparting step of imparting energy to the sensitizer, and comprising;

one or both of an energy transfer process and an electron transfer process, which include energy transfer or electron transfer from the energy-imparted

sensitizer to one or both of the bonding residues of the molecular structure and the bonding residues of the crosslinking agent; and

a step of crosslinking the bonding residues in the molecule of the molecular structure with the crosslinking agent by the energy transfer process or the electron-imparting process, to obtain a molecular aggregate having a plurality of molecular structures three-dimensionally joined through the crosslinking agent.

17. The method of producing a molecular device according to any one of claims 13 to 16, wherein the energy imparted to the sensitizer in the energy imparting step is an energy originating in any one of an electron, an ion and an electromagnetic wave, or a combination thereof.

18. The method of producing a molecular device according to any one of claims 13 to 16, wherein the energy imparted to the sensitizer in the energy imparting step is a light energy due to any one of ultra-violet ray, visible ray and infrared ray, or the combination thereof.

19. The method of producing a molecular device according to any one of claims 13 to 16, characterized in that the energy imparted to the sensitizer in the energy imparting step is a light energy due to any one of ultra-violet ray, visible ray and infrared ray, or the combination thereof;

and that the energy transfers from the energy-imparted sensitizer to the bonding residues through an energy transfer process.

20. The method of producing a molecular device according to claim 19, wherein the energy imparted to the sensitizer in the energy imparting step is a light energy

due to any one of ultra-violet ray, visible ray and infrared ray, or the combination thereof,

and the energy transfer in the energy transfer process is a triplet energy transfer process.

21. The method of producing a molecular device according to any one of claims 13 to 20, wherein the bonding residue is an optically bonding residue.

22. The method of producing a molecular device according to any one of claims 13 to 20, wherein the bonding residue has at least one of one or both of a double bond and a triple bond.

23. The method of producing a molecular device according to any one of claims 13 to 20, wherein the bonding residue is one of a cinnamic acid group, an α-cyano cinnamic acid group, a coumalin group, a chalcone group, a cinnamylidene acetate group, a p-phenylene diacrylate group, an acetylene group, a diacetylene group, a diphenyl acetylene group and an anthracene group.

24. A method of producing a molecular device including:

a step of obtaining the molecular structure having a shell structure, using a molecular structure having a higher atomic density in the periphery than in the interior and having bonding residues in the periphery, and a photo sensitizer molecule that is included inside the molecular structure, or is covalently bonded, ionically bonded, coordinately bonded, metallically bonded or hydrogen bonded with the molecular structure; and joining the bonding residues by photo irradiation to.

25. The method of producing a molecular device according to claim 24, characterized in that the molecular structure is constituted by a skeleton portion having a skeleton structure and a terminal portion which is arranged in the outer shell of the skeleton portion, has a higher atomic density than that of the skeleton portion, and has a plurality of bonding residues;

and that in the shell-forming step, the bonding residues in the terminal portion of the molecular structure are joined by irradiating the photo sensitizer molecule with light.

26. The method of producing a molecular device according to claim 24, characterized in that the plurality of bonding residues present in the terminal portion are joined to obtain the molecular structure having the shell structure.

27. The method of producing a molecular device according to claim 24, characterized in that the method further includes the use of molecules of a crosslinking agent, makes the molecules of the crosslinking agent crosslink with the bonding residues, and a plurality of molecular structures three-dimensionally joined through the crosslinkable molecule.

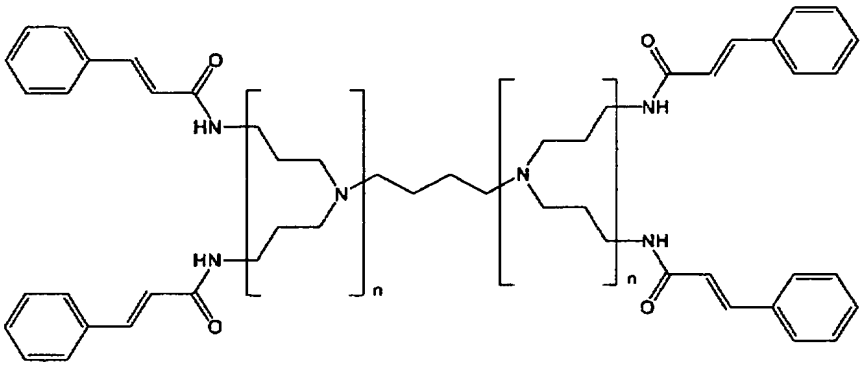
28. The method of producing a molecular device according to any one of claims 24 to 27, wherein the bonding residue is an optically bonding residue.

29. The method of producing a molecular device according to any one of claims 24 to 27, wherein the bonding residue has at least one of double bonds and/or triple bonds.

30. The method of producing a molecular device according to any one of claims 24 to 27, wherein the bonding residue is any one of a cinnamic acid group, an α-cyano cinnamic acid group, a coumarin group, a chalcone group, a cinnamylidene acetate group, a p-phenylene diacrylate group, an acetylene group, a diacetylene group, a diphenyl acetylene group and an anthracene group.

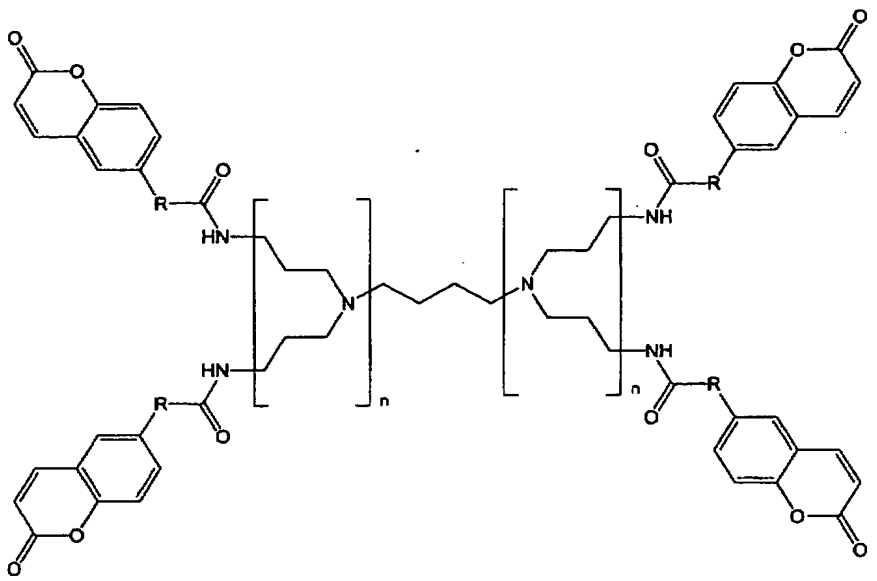
31. The method of producing a molecular device according to any one of claims 13 to 30, wherein the molecular structure is a dendrimer.

32. The method of producing a molecular device according to claim 31, wherein the dendrimer is expressed by the following formula (I) or (II):



(I)

wherein n represents an integer of 10 or less, and



(II)

wherein n represents an integer of 10 or less and R represents a linkage group.

33. The method of producing a molecular device according to claim 32, wherein R in the general formula (II) is an alkenyl group with C_1 to C_{10} or an alkynyl group with C_2 to C_{10}.

34. The method of producing a molecular device according to claim 32 or 33, wherein each n in the general formulas (I) and (II) is an integer of 2 to 10.

35. A molecular structure having a shell structure obtained by: using a molecular structure constituted by a skeleton portion having a skeleton structure, and a terminal portion which is arranged in the outer shell of the skeleton portion, has a higher atomic density than that of the skeleton portion and has a plurality of bonding residues, and a photosensitizer included inside the molecular structure;

and joining the bonding residues in the terminal portion by taking advantage of the spectral sensitization of the photosensitizer molecules irradiated with light.

36. A molecular aggregate obtained by: using a molecular structure constituted by a skeleton portion having a skeleton structure, and a terminal portion which is arranged in the outer shell of the skeleton portion, has a higher atomic density than that of the skeleton portion and has a plurality of bonding residues, a photosensitizer included inside the molecular structure, and a crosslinking agent;

and crosslinking the bonding residues with the molecules of the crosslinking agent through irradiating the photosensitizer molecules with light to join a plurality of molecular structures.

37. A molecular device including the molecular structure having the shell structure according to claim 35, or the molecular aggregate according to claim 36.